

# PATENT SPECIFICATION

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(19)



NATIONAL REFERENCE  
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 AND INVENTION

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## (54) PROCESS FOR MANUFACTURING ABRASIVE BODIES BONDED WITH PLASTICS MATERIAL OR RUBBER

(71) We, METALLGESELLSCHAFT AK-  
 TIENGESELLSCHAFT, a body corporate organ-  
 ised under the Laws of Germany, of 14  
 Reuterweg, Frankfurt-on-the-Main, Ger-  
 many, do hereby declare the invention, for  
 which we pray that a patent may be granted  
 to us, and the method by which it is to be  
 performed, to be particularly described in  
 and by the following statement:—  
 This invention relates to a process for  
 manufacturing abrasive bodies bonded with  
 plastics material or rubber.  
 It has been proposed to make abrasive  
 bodies by moulding a mixture of a binder  
 of granulated or powdered rubber or plas-  
 tics material and a granular or powdered  
 grinding or polishing material, particularly  
 at an elevated temperature. It has also  
 been proposed to make such abrasive  
 bodies, which are bonded with rubber or  
 plastics material, by casting a mixture of  
 particulate abrasive material and liquefied  
 plastics material in a mould. This method  
 of manufacture is fairly time-consuming,  
 which is a great disadvantage for mass pro-  
 duction. Besides, in most of the above-  
 mentioned methods of manufacture, a uni-  
 form distribution of the grinding or polish-  
 ing material within the finished abrasive  
 bodies is not ensured and the density of  
 these bodies is not uniform throughout their  
 cross-section so that they are not economi-  
 cal in consumption. For these reasons, the  
 abrasive action of a given abrasive body  
 varies in different stages of its wear so that  
 the abrasive effect must be carefully  
 checked.  
 It has been proposed to avoid an irregu-  
 lar distribution of the abrasive material in  
 abrasive bodies bonded with plastics mat-  
 erial by filling the granular abrasive ma-  
 terial into a mould which conforms to the  
 abrasive member to be made and which is  
 provided with nozzles and venting conduits,

compacting the granular abrasive material, 45  
 e.g., by an ultrasonic treatment, and in-  
 jecting a thermosetting or thermoplastic  
 synthetic material under pressure through  
 the nozzles into the interstices between the  
 compacted particles of the abrasive ma- 50  
 terial. Even this process does not ensure  
 in many cases a uniform distribution of the  
 granular abrasive material and the process  
 can be used only with a relatively coarse- 55  
 grained abrasive material. Besides, the pro-  
 cess is complicated and expensive and for  
 this reason cannot be applied to the mass  
 production of abrasive bodies bonded with  
 plastics material or rubber.

It has been proposed to make an abra- 60  
 sive body in the form of a gear finishing  
 tool by pressure casting a plastic abrasive  
 resin compound. In this pressure casting  
 operation, the compound is introduced  
 under pressure into a substantially closed 65  
 annular space, the axis of which is verti-  
 cal, there being vent openings in a cover plate  
 forming the upper surface of the space. The  
 compound is introduced through a fitting 70  
 positioned between two vent openings and  
 flows circumferentially around the space ex-  
 pelling air through the vent openings. As  
 the compound reaches the vent openings  
 adjacent the fitting, the compound starts to 75  
 flow out of the openings and, at this time,  
 suitable plugs of plastics material are in-  
 serted in the openings. The casting opera-  
 tion continues until the annular space is  
 filled and all the vent openings have been  
 plugged.

In contradistinction to this previous pro- 80  
 posal, the present invention provides a pro-  
 cess for manufacturing an abrasive body  
 bonded with a plastics material or rubber,  
 wherein a mixture of granular or powdered 85  
 grinding or polishing material and a binder  
 comprising plastics material or rubber, the  
 binder being in the form of crumbs, a

[Price 25p]

powder, a liquid or a combination of two or more such forms, is injection moulded in a mould comprising a central sprue connected to a plurality of mould cavities, whereafter the resulting abrasive bodies formed in said mould cavities are separated from the resulting sprues. The resulting sprues are conveniently comminuted and added to the next charge of mixture to be injection moulded.

In contradistinction to a pressure casting process in which the material is introduced relatively slowly into a mould cavity, particularly in the previously proposed process where each pair of vent openings must be plugged before the material can be allowed to flow to the next pair, the use of injection moulding in accordance with the present invention causes intensive mixing of the ingredients and, as the material is injected relatively quickly into the mould cavity, prevents segregation of the constituents of the injected material.

The present process is mainly based on the recognition that the injection moulding process can be carried out even if the plastics moulding material contains a high proportion of fillers, particularly highly abrasive fillers, and even in intricate moulds. For use in industrial abrading operations, a body of plastics materials must contain a filler consisting of a grinding or polishing material in an amount of at least 5% of the total weight of the body. It has been found that the present process may be used to make abrasive bodies which contain up to 80% by weight of the abrasive material. High requirements of abrading technology will be met by a grinding or polishing body which contains grinding or polishing material in an amount of 40 to 60% by weight of the finished body. For this reason it will be suitable in the present process to provide a mixture which is to be injection-moulded and which contains grinding or polishing material in an amount of 40 to 60% of the weight of the finished body.

The present process is particularly suitable for the manufacture of abrasive bodies which are used in bulk for drum grinding processes or vibrating drum grinding processes. The abrasive bodies used in these processes must be relatively small so that a mass production technique is advantageous for the manufacture of said abrasive bodies. Furthermore, these abrasive bodies must have a certain external shape and for this reason cannot be made only and with a uniform smooth surface by the previously proposed processes, particularly the spherical shapes which are often required when the abrasive bodies are used in bulk.

The present process has the advantage that, contrary to the previously proposed

processes, abrasive material having a desired particle size may be used without fear of segregation, and any kind of rubber or plastics material may be used in the present process. Materials which are particularly suitable include high-pressure and low-pressure polyethylene, polypropylene, polystyrene and polyvinyl chloride. Instead of the plastics materials, precursors of such plastics materials may be used, provided that they react as desired during the moulding process so that the reaction product removed from the mould has a sufficiently high dimensional stability. The injection-moulding machine may be adapted to be suitable to operate with such starting products. Agents for foaming the plastics material may be added to the mixture to be moulded so that porous abrasive bodies can also be made. Colouring matter may be added so that the finished abrasive body has a colour which indicates the use to which it can be put in view of its composition.

The invention will now be illustrated by the following Examples.

#### EXAMPLE 1

A mixture of 30 parts by weight polypropylene powder and 70 parts by weight silicon carbide having a particle size of about 10 microns was made in an impeller mixer. The resulting mixture was charged into the plasticizing screw of an injection-moulding machine, in which the mixture was injected into a mould. The mould had a central sprue connected to 48 mould cavities. Each moulding was tar-shaped and had an outside diameter of 25 millimetres and a thickness of 12 millimetres. About 2 kilograms of these mouldings were made per minute. To remove the sprues from the abrasive bodies, 50 kilograms of the latter were charged into a rotating screening drum. When the screening drum had been rotated for about five minutes, all the mouldings had dropped through the screening drum into a container placed under the drum whereas the sprues remained in the screening drum and were removed through the charging opening before the next charge was introduced. The sprues were comminuted and then added to the next charge of raw material.

#### EXAMPLE 2

In the machine used in Example 1, a mixture consisting of 60 parts by weight polyethylene powder and 40 parts by weight electrocorundum having a particle size of 10 microns was injection-moulded. A mould was used which had 60 mould cavities, in which abrasive bodies in the form of tetrahedra having a height of 15 millimetres

were made at a rate of 2 kilograms per minute.

### EXAMPLE 3

- 5 In the machine used in the preceding Examples, polishing bodies were made from a mixture of 95 parts by weight of polystyrene powder and 5 parts by weight of quartz powder. A mould having 60 mould cavities was used, in which spherical abrasive bodies were made at a rate of 2 kilograms per minute.

### WHAT WE CLAIM IS:—

- 15 1. A process for manufacturing an abrasive body bonded with plastics material or rubber, wherein a mixture of granular or powdered grinding or polishing material and a binder comprising plastics material or rubber, the binder being in the form of crums, a powder, a liquid or a combination of two or more such forms, is injection moulded in a mould comprising a central sprue connected to a plurality of mould cavities, whereafter the resulting abrasive bodies formed in said mould cavities are separated from the resulting sprues.

2. A process as claimed in Claim 1, wherein the mixture to be moulded contains grinding or polishing material in an amount of 5 to 80% of the weight of the finished body.

3. A process as claimed in Claim 1 or 2, wherein the mixture to be moulded contains grinding or polishing material in an amount of 40 to 60% of the weight of the finished body.

4. A process as claimed in any preceding Claim, wherein the resulting sprues are comminuted and added to the next charge of mixture to be injection moulded.

5. A process for manufacturing an abrasive body substantially as hereinbefore described in any one of the foregoing Examples.

6. An abrasive body manufactured by the process claimed in any preceding Claim.

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